H1-6.1.6 ARA-12 (ARA-III Radioactive Waste Leach Pond)

The ARA-12 site is an unlined surface impoundment constructed in a natural depression west of ARA-III across Wilson Boulevard. The ARA-III facility was an active reactor research facility from about 1959 to 1965. The pond was constructed to receive low-level liquid waste from reactor research operations. Liquid waste was stored temporarily in tanks, then transferred to the leach pond via an underground pipe. Effluent contained chromium, used in solutions to inhibit algae growth, and minute amounts of low-level radioactive material. A second, separate line to the leach field originated in an uncontaminated water storage tank (ARA-709). A third source of effluent was facility runoff via a culvert. From 1966 to 1987, activities at ARA-III were limited to component and instrumentation testing, instrumentation development and fabrication, and chemical research. No known waste was disposed in the leach pond associated with these activities. In 1991, the culvert was plugged in preparation for D&D operations at ARA-III. The tanks and waste lines to the leach pond were removed in 1993 during the D&D of ARA-III.

A Track 2 evaluation was initiated in 1993 and completed in 1994. Radiological and topographical surveys were performed, and soil samples were collected and analyzed. The outer dimensions of the pond were estimated as 11 × 50 m (377 × 164 ft). A smaller area of approximately 21 × 61 m (69 × 200 ft), which received the majority of the wastewater, still contained remnants of enhanced vegetation. The 1993 data were combined with historical information to evaluate nonintrusive 100-year future residential and current occupational default exposure scenarios defined in Track 2 guidance (DOE-ID 1994). Future residential intrusive and future occupational scenarios were not assessed. Evaluated contaminants included Ag-108m, Cs-137, U-235, Am-241, Co-60, Pu-238, U-234, chromium, cadmium, lead, and Aroclor-1254. A total risk of 2E-03 and a hazard index of 0.3 were estimated for the 100-year future residential nonintrusion scenario using default parameters. The risk from direct exposure is 2E-03 and is primarily from Ag-108m, Cs-137, and U-238. The entire 0.3 hazard index is associated with the groundwater ingestion of cadmium and chromium. For the current occupational scenario, a total risk of 1E-03 was estimated. The primary risk drivers were identified as Ag-108m, Co-60, and Cs-137 in the direct exposure pathway and chromium in the inhalation of fugitive dust pathway.

Following review of the Track 2 evaluation, DOE-ID, the EPA, and the Idaho Division of Environmental Quality (IDEQ) concurred that the site should be evaluated in an RI/FS. However, no sampling data gaps were identified for ARA-12 in the WAG 5 Work Plan (DOE-ID 1997). The ARA-12 site was retained for quantitative risk analysis in the comprehensive RI/BRA to evaluate the risk from chromium, lead, manganese, Ag-108m, Am-241, Co-60, Cs-137, Pu-238, U-234, and U-238. The ARA-12 site also was retained on the basis of in situ Cs-137 data obtained with the ground penetrating radar system (GPRS). The GPRS was used to survey the ARA-12 site as part of the ARA-24 in situ gamma survey to enhance understanding of the contamination at ARA-12. When the data from the GPRS were analyzed, Cs-137 concentrations greater than 45 pCi/g were indicated for an area just west of the ARA-12 site boundary. Because the area is debris-filled and nearly inaccessible to the GPRS, a germanium spectrometer (Ge-spectrometer) was deployed to determine the extent of the contamination. When the extent of contamination is known, the ARA-12 site boundary will be expanded (DOE-ID 1999).

H1-6.1.7 ARA-16 (ARA-I Radionuclide Tank)

The ARA-16 site is a 3,785-L (1,000-gal) stainless steel underground holding tank resting within a lidless concrete vault and covered by approximately 1.1 m (3.5 ft) of soil. The ARA-I facility was formally shut down in 1988, and the tank was partially excavated. All lines into and out of the tank were cut and capped, and the contents of the tank were agitated and pumped out, leaving approximately 8 cm (3 in.) or109 L (28 gal) of liquid and sludge. Samples were collected and analyzed, two for metals, one for sulfate, and one for VOCs. Through sampling results and anecdotal information, the waste was identified as containing F-listed mixed waste along with transuranic elements. Soil surveys conducted during the partial excavation indicated beta-gamma rates between 400 to 1,000 disintegrations per minute. Soils from the excavation were replaced over the tank. As identified in the WAG 5 Work Plan (DOE-ID 1997), to adequately characterize the contents of the tank, additional sampling was necessary.

Four separate potential contamination areas or sources are associated with the ARA-I radionuclide tank: (1) the tank contents, (2) the surface and subsurface soil and gravel inside the concrete vault, (3) the concrete itself, and (4) the surface and subsurface soil outside the concrete vault within the 9.1 × 9.1-m (30 × 30-ft) fenced area. Sampling strategies were developed for each potential contamination area, except for the concrete. To sample the concrete would have required destructive techniques that would have compromised the integrity of the vault. The sampling data gaps identified in the WAG 5 Work Plan (DOE-ID 1997) have been filled as summarized below. The ARA-16 site was retained for quantitative risk analysis in the RI/BRA to evaluate the risk potential from chloride, sulfate, Ag-108m, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Ra-226, and Sr-90.

A conclusion of the Track 1 investigation was that the surface and subsurface soil and gravel inside the concrete vault at the ARA-16 site were contaminated because of possible leaks and spills during pumping or filling operations. It was not known whether the tank itself had leaked. The FSP for the WAG 5 Work Plan (DOE-ID 1997) contains a complete description of the planned sampling. The original plan was to drill a borehole within each of the four corners of the concrete vault to the bottom and to collect samples from the top and bottom of each borehole. In addition, a surface sample was to have been collected from the tank center, but when the drill rig was mobilized to begin drilling between the tank and the vault, there was concern that either the vault or the tank might be damaged during drilling. Instead, four boreholes were drilled using a hand auger, and samples were taken at the vault bottom. When radiological control personnel field surveyed the samples, the readings showed no radionuclides above background. The samples were sent for laboratory analysis (DOE-ID 1999).

H1-6.1.8 ARA-25 (ARA-I Soils Beneath the ARA-626 Hot Cells)

The ARA-25 site was identified during the final development of the WAG 5 comprehensive RI/FS and recently added to the FFA/CO Action Plan (DOE-ID 1991). As part of the ongoing D&D activities at ARA I, radiologically contaminated concrete floor slabs were cut out of the ARA-626 Hot Cells (Cells No. 1 and No. 2). Because the concrete was poured directly on the soil, the undersides of the slabs (about 6 in. thick) were covered completely with soil. In a radiological evaluation of the soils that sloughed off the underside of the concrete slabs and on the rebar protruding from the concrete, the initial contamination levels of 50,000 disintegrations per minute were identified. However, this determination was difficult to verify because of the radiological interference generated by the tops of the hot cell floor slabs.

The floor drains and accompanying drain lines in the hot cells were connected into the hot cell floors through welding to the carbon steel floor cladding. At one time, stainless steel piping connected these drains to the ARA-729 hot waste tank (ARA-16 site). The ARA-729 tank contains PCB-contaminated, listed mixed waste, and transuranic radionuclides. Six other drain lines also were connected to the ARA-729 tank. These other lines are from the decontamination room, the service area, the hot metallurgy area, a hot laboratory (Room 125), and two isolation areas. The isolation area was located immediately behind the hot cells, was used for initial decontamination of equipment removed from the cells, and also was used for repair and modification of equipment.

In 1998, D&D removed the hot cells, and the soils and concrete floor slab were sampled. Three samples were taken of the soil where the floor drains had been located, and three samples were taken of the concrete. After sampling, a fixative was applied to the soils exposed under the concrete slabs and the roof of Building ARA-626 was placed over the entire area for shielding.

The ARA-25 site was retained for quantitative risk assessment in the comprehensive BRA to evaluate the risk from contamination detected in the soils. The contamination from the concrete was not evaluated for risk because the concrete will be removed as part of the remediation of WAG 5. Detected contaminants retained for human health risk evaluation include arsenic, copper, lead, manganese, Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Ra-226, Sr-90, and U-235 (DOE-ID 1999).

H1-6.1.9 PBF-04 (PBF Control Area Oil Tank at PBF-608 (Substation) Outside PBF Fence

The PBF-04 site is the historical site of a 3,785-L (1,000-gal) underground storage tank used to store heating fuel for the PBF Substation Control house (PBF-608) from 1962 to 1976. The site is immediately adjacent to the building and about 305 m (1,000 ft) south of the PBF Control Area. The tank was originally installed directly over the grounding grid for the 138-kv substation that services all of ARA, the five facilities within PBF, and the Security Training Facility. Excavated in 1990, the tank was found in very poor condition with observable rust and pinholes. Soils in the excavation were discolored. Because of safety issues related to the proximity of the substation and grounding grid, only 9 m^3 (12 yd^3) of contaminated soils were removed. The remaining soils were sampled for TPH and benzene, toluene, ethylbenzene, and xylene, and the excavation was backfilled with clean soil. Benzene was identified in four or five samples at concentrations ranging from 0.1 to 0.4 mg/kg compared to a site-specific risk-based soil contamination of 0.088 mg/kg back calculated with groundwater screen in the Track 1 evaluation of the site. The only pathway of concern was ingestion of groundwater. Risk-based concentrations for all other pathways were at least two orders of magnitude greater than detected concentrations.

Sampling data gaps were identified in the WAG 5 Work plan (DOE-ID 1997) for PBF-04. However, because this site has safety concerns related to the electrical grounding grid that underlies the site, the Work Plan identified that the sampling results from PBF-31 and PBF-32 would be correlated to PBF-04. Because the sampling results from PBF-31 and PBF-32 were below EPA Region 3 risk-based concentrations, PBF-04 was not retained for quantitative risk analysis in the WAG 5 comprehensive RI/BRA.

H1-6.1.10 PBF-10 (PBF Reactor Area Evaporation Pond)

The PBF-10 site was a Hypalon-lined surface impoundment with an approximate area of 1,820 m^2 (19,600 ft^2). Effluent routed to the pond from 1972 to 1984 included chromium-contaminated water from the PBF Reactor secondary coolant loop and discharges containing resins, sulfuric acid, and sulfur dioxide from the demineralizer system. Sulfur dioxide was added to the system to convert chromium(VI) to chromium(III). Subsequent to 1984, discharges to the pond did not contain chromium. In sampling conducted before the FFA/CO (DOE-ID 1991) concentrations of total chromium and Cs-137 were identified in the pond sediments at greater than risk-based levels. Therefore, an interim action was implemented. The 1994 interim action included excavation of sediments from the pond in areas with chromium concentrations greater than 800 mg/kg or Cs-137 concentrations greater than 30 pCi/g. Post-removal verification sampling from sediments above and below the liner verified the adequacy of the interim action. The pond was divided into 49 grids, each with an area of 37 m^2 (400 ft^2). Sediments were removed down to the liner in 21 of the 49 grids, containerized, and transported to the RWMC. Post-removal samples collected above the liner yielded Cs-137 concentrations ranging from 11.17 to 17.5 pCi/g and chromium concentrations ranging from 213.0 to 309.0 mg/kg. One of four locations sampled below the liner had a Cs-137 concentration of 0.04 pCi/g. Cesium was not detected in the other three samples. Chromium was detected below the liner in concentrations ranging from 14.4 to 23.0 mg/kg. In 1995, the pond liner was removed and disposed in the CFA Bulky Waste Landfill. The berm was pushed into the pond, and the area was graded and seeded with native grasses. No sampling data gaps were identified in the WAG 5 Work Plan (DOE-ID 1997). The PBF-10 site was retained for quantitative risk assessment in the RI/BRA to evaluate the risk potential from Cs-137 contamination remaining in the evaporation pond soils after the completion of the interim action (DOE-ID 1999).

H1-6.1.11 PBF-16 (PBF SPERT-II Leach Pond)

The PBF-16 site is a fenced, unlined surface impoundment, with approximate dimensions of 70 × 51 m (230 × 167 ft), located south of the SPERT-II Reactor Building. From 1959 to 1964, the leach pond was used for disposal of demineralizer influent, water softener waste, emergency shower drain water, and discharges from the floor drains from the reactor building. Currently, the only discharge to the pond is clean water from the PBF maintenance shop air compressor. A characterization of the leach pond was conducted in 1982 and 1983. The 1982 characterization consisted of collecting 18 soil, two water, and several vegetation samples and analyzing for radionuclides. The radioactivity levels were within background values. In 1983, the pond was characterized for hazardous constituents. Only mercury and lead were detected above INEEL background concentrations. Mercury was detected at 32 mg/kg. No sampling data gaps were identified in the WAG 5 Work Plan (DOE-ID 1997). The PBF-16 site was retained for quantitative analysis in the RI/BRA to assess the risk potential from lead.

H1-6.1.12 PBF-21 (PBF SPERT-III Large Leach Pond)

The PBF-21 site is the historical location of a leach pond that received waste from the sump pump in the SPERT-III Reactor Building from 1958 to 1968. Primary coolant water was drained to the pond. The pond was characterized in 1982 and subsequently backfilled by the D&D program. The D&D data were reviewed during the Track 1 qualitative risk assessment and were found insufficient to support a No Further Action recommendation because hazardous constituents had not been analyzed. Additional samples were collected in 1993 to determine the presence or absence of hazardous substances. No concentrations were detected above risk-based soil concentrations, but the lowest elevation in the pond was not sampled. However, evidence indicates that low-level radioactive contaminated soils are located beneath the surface at depths of 7 to 8 ft. The Track 1 evaluation of the site identified unacceptable risk via the external exposure pathway in both the occupational and 100-year future.residential intrusion scenarios. Cesium-137 concentrations were detected in a range from 0.2 to 18.0 pCi/g. Cobalt-60 was detected in concentrations from 0.8 to 6.5 pCi/g. All other detected radioactivity was below the background values. No sampling data gaps were identified in the WAG 5 Work Plan (DOE-ID 1997). The site was retained for quantitative risk analysis to evaluate the risk potential from chloride, orthophosphate, sulfate, Co-60, Cs-137, U-234, U-235, and U-238.

H1-6.1.13 PBF-22 (PBF SPERT-IV Leach Pond)

The PBF-22 site was an unlined surface impoundment that received effluent from the SPERT-IV reactor from 1961 to 1970. Effluent consisted of radioactively contaminated wastewater, emergency shower water, and demineralizer discharges. Occasional discharges from the waste holdup tank were routed to the pond from 1979 to 1982. In the early 1980s, the pond received contaminated primary coolant effluents from the SPERT-IV Reactor. In 1985, the area was surveyed, and approximately six 0.6 × 1.2 × 2.4-m (2 × 4 × 8-ft) boxes of soil were removed and transported to the RWMC. Sample results from 1988 and 1994 were evaluated and Aroclor 1254, chromium, and mercury were detected at 0.780, 147, and 0.11 mg/kg, respectively. A Track 2 evaluation was performed for the site, and no unacceptable risks were identified. Potential risks from groundwater ingestion were reevaluated in 1996. Because of insufficient discharge history, the source term was assumed to comprise the entire area of the pond to a depth of 3 m at the highest concentrations detected in 1988. The reevaluation indicates a risk of 1E-06 because of Aroclor-1254, but unsaturated travel time is more than 1,000 years with peak at 1.56E+4 years. No sampling data gaps were identified in the WAG 5 Work Plan (DOE-ID 1997). The site was retained for quantitative risk analysis to evaluate the risk potential from arsenic, lead, manganese, Am-241, Cs-137, Pu-238, Pu-239, Th-228, Th-230, Th-232, U-234, and U-238.

H1-6.1.14 PBF-26 (PBF SPERT-IV Lake)

The PBF-26 site is a surface impoundment constructed in 1960 by erecting a dike 91 × 1.8 m (300 × 6 ft) high, composed of soil and rock, to close off an irregularly shaped natural depression. The dike formed a containment area with an approximate volume of 23 million L (6 million gal). The center of the area is approximately 244 m (800 ft) south of the Mixed Waste Storage Facility. From 1961 to 1970, the lake received uncontaminated cooling water from the secondary loop of the SPERT-IV reactor and was inactive until 1985. From 1985 to 1992, the only discharges to the lake were uncontaminated effluent from Three Mile Island studies and discharges generated by periodic testing of emergency eye wash and shower stations. With the removal of the pipeline to the lake in 1992, all discharges to the lake ended. Historical sampling showed a single high detection of 13 mg/kg of Aroclor-1254, and potential risks from Cs-137, uranium, and chromium were identified. But the source of contamination is unknown. Low concentrations of PCBs also were detected in the pipeline between the lake and the Mixed Waste Storage Facility. A time-critical removal action was recommended for the site. In 1995, before the removal action, field immunoassay kits for PCBs were used to determine the vertical and horizontal extent of contamination. Using the immunoassay kits, only one location was detected with a concentration greater than the 10-mg/kg field screening level agreed upon by DOE, EPA, and IDEQ. The duplicate confirmation sample sent to an off-Site lab indicated a PCB concentration of 4.4 mg/kg. Cesium-137 was detected in five samples with concentrations ranging from 0.70 to 4.7 pCi/g. Because the analytical results for PCB were below the 10 mg/kg field screening level, the planned removal action was not performed. It is possible that the PCB contamination was removed during sampling. Though the results of the 1995 sampling activity failed to identify PCB contamination, this site was included for evaluation in the BRA. No sampling data gaps were identified in the WAG 5 Work Plan (DOE-ID 1997). The site was retained for quantitative risk analysis in the RI/BRA to evaluate the risk potential from arsenic, lead, Aroclor-1254, and Cs-137.

H1-7. WAG 6

H1-7.1.1 WAG 6 Description

WAG 6 sites have been included under the WAG 10 assessment.

H1-8. WAG 7

H1-8.1.1 WAG 7 Description

WAG 7 is the RWMC. The RWMC was established in 1952 as a controlled area for disposal of solid radioactive waste generated by DOE operations at the INEEL and other DOE sites. The primary RWMC site is the Subsurface Disposal Area (SDA), including numerous pits, trenches, and vaults containing waste, as well as a large pad where waste was placed abovegrade and covered. The Transuranic Storage Area (TSA) within the RWMC has been used since the early 1970s for retrievable storage of transuranic waste on earthen-covered pads and in facilities.

The WAG is divided in to 14 OUs including the air, groundwater, and surface-water pathways, as well as the vadose zone for both radionuclide/metals and organics.

H1-8.1.2 WAG 7 ERA Efforts

Ecological risk assessment efforts at WAG 7 include preliminary risk evaluation for Pit 9 (both human and ecological risk assessments were performed). This assessment was conducted for the contaminants associated with Pit 9. The evaluation of site contaminants was based on estimated inventory data.

A baseline risk assessment for the Pit 9 SDA was also conducted (both a human and ecological risk assessment). The input for this assessment was based on fate and transport modeling using an estimated inventory of contaminants as an initial source; no sampling data was available.

Work Plan for OU 7-13/14 WAG 7 Comprehensive RI/FS, (DOE-ID 1996b). This document contains the ecological contaminant screening. This analysis was conducted to determine which of the more than 200 contaminants buried at the SDA have the potential to cause adverse effects to ecological components. This analysis eliminates those contaminants posing low to no likelihood of risk, so that subsequent BRA efforts might be focused on COPCs. Although a formal screening level ecological risk assessment (SLERA) was not performed, the basic exposure assessment and effects assessment methodology were incorporated. The screening performed here was tailored specifically for this analysis, and the screening did not include detailed information generally presented as part of SLERA problem formulation and analysis. The Work Plan at this time included a detailed discussion of the WAG 7 ERA effort for the Comprehensive RI/FS.

The revised the original scope of Work Plan and eliminated all ecological risk assessment work after the preliminary screening. The ERA will be focused and completed in parallel with the FS. The ERA will be evaluated against likely remedial alternatives.

The documents the work plan addendum rationale. The key assumptions related to ERA include:

- The ERA will be a component of the FS in conjunction with the remedial alternatives and not quantified in the BRA
- Ecological risk and human health risks via surface exposure pathways will be evaluated qualitatively in the BRA.

The preliminary screening of the SDA indicates that many contaminants remain a potential concern at the SDA. Although this screening cannot be included in the WAG ERA summaries due to the dissimilarity of approaches, a number of radionuclides were maintained as a potential concern for OU 10-04 due to the results of this analysis. Because of scheduling, WAG 7 will complete their ERA efforts during their FS process after the sitewide OU 10-04 ERA has been performed. Any ecological issues identified at this time will be addressed by WAG 7.

H1-9. WAG 8

H1-9.1.1 WAG 8 Description

WAG 8 is the Naval Reactors Facility (NRF), operated by Bechtel Bettis, Inc for the DOE Naval Reactors Program. This facility contains prototype Naval reactors used for research and development and for training of Naval personnel. The NRF also contains the Expended Core Facility, which supports research and development efforts on reactor materials by preparation and examination of irradiation test specimens and irradiated Naval reactor fuel.

Potential sites include landfills, old spills, wastewater disposal systems (e.g., ponds, ditches, basins, drains, and drain fields), and storage areas. The WAG is divided into 9 OUs with 76 potential release sites.

H1-9.1.2 WAG 8 ERA Results

The WAG 8 ERA was performed in 1996. WAG 8 determined, based on a qualitative evaluation, that any ecological risk subsequently associated with WAG 8 will be the final responsibility of WAG 8 to address.

"A SLERA evaluated the known or potential sites at NRF where previous investigations and sampling had determined that a source of contamination remained. Risks were calculated for six representative wildlife species based on an INEEL guidance manual for performing SLERAs. Organic, inorganic, and radiological constituents were evaluated through the ingestion and external exposure pathways. Assessment results were used to compare risks. Calculated screening level quotients were not considered to be additive because of the potential for compounding the uncertainty.

Based of the results of samples collected since 1987 and toxicity values used at other INEEL facilities, the metals arsenic, lead, and mercury were the risk drivers for ecological receptors at NRF. Radionuclides and organics were also contributors to the overall ecological risk, but the risks were very low. No additional ecological risk assessments were deemed necessary for radionuclide and organic compounds. NRF-23 (Sewage Lagoons) presented the highest potential ecological risk based on accessibility, attractiveness, number of constituents present, and associated risk.

The results of the SLERA were also used to select receptors for additional ecological risk assessment. Receptors were selected on the basis of potential exposure and perceived value to society. The SLERA determined that deer mice, bald eagles, and mallard ducks were the primary receptors of concern. Deer mice were calculated to receive some of the highest exposures in the vicinity of NRF. Bald eagles were selected because they prey upon deer mice, are a threatened species, and are perceived as a valued species by the general public. Mallards were a receptor of concern because they breed in the vicinity of the sewage lagoon, can be prey for bald eagles, and are a game species.

The ecological risk assessment addressed the effects of arsenic, lead, and mercury on the three receptors identified in the SLERA. Exposure values for these metals were calculated for each receptor and compared to a range of exposure values that resulted in no observable adverse effects to laboratory test animals. These comparisons were qualitatively assessed, since no studies were found that directly measured the effects of arsenic, lead, and mercury on the receptor species. The weight average concentration for each of these constituents at NRF was also compared to background levels. The risk associated with the exposures to the ecological receptors is characterized as low. Although there are uncertainties associated with this screening assessment, the results indicate that no additional actions are required due to estimated risks to ecological receptors (DOE-ID 1998, Final ROD, NRF)."

H1-10. WAG 9

H1-10.1.1 WAG 9 Description

WAG 9 is the ANL-W complex. ANL-W operates the EBR II, the first pool-type liquid-metal reactor. The complex also has four other reactors and two fuel examination facilities.

Potential sites include tanks and wastewater handling/disposal systems such as ditches, ponds, pits, and drains. The WAG consists of four OUs with 37 potential release sites.

Attachment H1-1 presents a summary of the sites of potential concern for ecological risk assessment.

H1-10.1.2 ANL-01 (OU 9-04: Industrial Waste Pond)

This section summarizes the analytical results for soil samples collected at the Industrial Waste Pond (IWP) (ANL-01). This pond was used to receive cooling tower waste associated with the EBR-II and any discharges to the North Ditch, and the ditches were used to transport these waste to the pond. Waste types discharged to the pond include metals (from the cooling tower waste) and those wastes associated with the North Ditch (e.g., photo developers, fixers, and stabilizers, acids, ethanol, sodium hydroxide, and some radionuclides) and the Main Cooling Tower Blowdown Ditch (MCTBD) (ANL-01A). Only Ditches A and C are currently visible, while the majority of Ditch B was backfilled with clean soil to grade (approximately 1.5 m [5 ft]).

There is one main flow into the IWP. Of the three ditches, only Ditch B flows directly into the IWP. Ditches A,B, and C flow into the MCTBD before ultimately flowing into the IWP. Therefore, because the IWP and its three ditches are not necessarily in close proximity to each other, analytical results for the IWP and each of its three ditches will be presented separately.

Soil and sludge samples were collected from the IWP as part of four different investigations occurring from 1986 to 1994. For the purpose of this evaluation, analytical results from both soil and sludge are combined and referred to as soil samples. In a 1986 ANL-W study, four subsurface soil samples were collected from the vicinity of the inlet pipe. In 1987, one composite soil sample was collected from three locations approximately 30 to 60 m (100 to 200 ft) north of the inlet pipe. In 1988, six soil samples were collected throughout the eastern part of the IWP as part of a DOE survey; in 1994, 10 soil samples were collected throughout the entire pond.

Soil samples collected in 1986 were collected from approximately 13 cm (5 in.) bgs, the composite sample collected in 1987 was collected from 0 to 5 cm (0 to 2 in.) and from 5 to 10 cm (2 to 4 in.) bgs, and the samples collected in the 1994 study were collected from 0 to 15 cm (0 to 6 in.) bgs. Soil samples collected as part of the DOE Survey were all subsurface samples collected from either 0.6 m (2 ft) or 1 m (3 ft).

The majority of the contamination (i.e., detected organic compounds and concentrations of metals and radionuclides greater than the upper limit of background) is present in the southern and eastern part of the IWP with concentrations typically greatest near the inlet pipe in the southern part of the IWP. The highest number of metals above background were collected from location #101 with 11 metals exceeding background, then location #97 with ten metals exceeding background. Therefore, the horizontal extent of contamination is the dimensions of both the southern and eastern part of the IWP (61 m wide and 76 m long [200 ft wide and 250 ft long]).

Little information is available on the vertical extent of contamination because only six samples were collected at depths greater than 15 cm (0.5 ft). Also, the migration of contaminants from the surface sediments 0–15 cm 0–0.5 ft) to deeper sediments is difficult per one sample location (PND SED) had samples collected from two depth ranges (0 to 5 cm [0 to 2 in.] and 5 to 10 cm [2 to 4 in.]), and the deeper sample was analyzed only for metals. However, based on the analytical results of the 1988 DOE study, the contamination is bound in the top 15 cm (6 in.). This trend is similar to all the drainage ditches, that feed into the Industrial Waste Pond (ANL-W 1997).

H1-10.1.3 Industrial Waste Pond Ditch A

Soil samples were collected from the IWP Ditch A (herein after referred to as Ditch A as part of two different investigations. These studies are the Chen Northern (1988) and the 1994 study. In the 1988, Chen Northern study, eight soil samples were collected from three locations in the western part of the ditch. In the 1994 study, 30 soil samples were collected from 11 locations throughout the entire length of the ditch.

The contamination (i.e., concentrations of metals and radionuclides greater than the upper limit of background), depending on analyte, is present throughout the entire Ditch A. It appears that some of the highest results were detected of soils closest to the intersection of the MCTBD and Ditch A. Typically, the concentrations of contaminants are the highest in the surface 0 to 15 cm (0 to 6 in.) samples. The one exception to this is of the three samples for silver, for which the deeper samples contained the only detectable levels. Therefore, the horizontal extent of contamination is the dimensions of both the eastern and western part of Ditch A (1.5 m wide and 122 m long [95 ft wide and 400 ft long]) (ANL-W 1997).

H1-10.1.4 Industrial Waste Pond Ditch B

Soil samples were collected from the IWP Ditch B (herein after referred to as Ditch B) as part of three different investigations. Six soil samples were collected from the 1988 DOE study, 15 samples collected from the 1988 Chen Northern study, and 10 samples in the 1994 ANL-W study.

The majority of the metals contamination greater than the upper limit of background is present in the still used portion of Ditch B. This could be caused from the lack of samples in the buried portion of Ditch B or the large sampling ranges of the soils. Ditch B was sampled only for organics in the buried portion. Thus, the only organic contamination detected was in this section. The organic contamination detected included three VOCs (1,1,1-trichloroethane, acetone, and methylene chloride), one herbicide (2,4-D), and two semi-VOCs (bis(2-ethylhexyl)phthalate and di-n-butyphthalate), which are common laboratory contaminants. No radionuclides were detected above the upper limit of background in either portion of Ditch B. Therefore, based on the lack of continuous sampling of the buried and still-used portions of Ditch B, the horizontal extent of contamination is the dimensions of both sections of Ditch B (1.5 m wide and 427 m long [5 ft wide and 1,400 ft long]) (ANL-W 1997).

H1-10.1.5 Industrial Waste Pond Ditch C

A total of 24 soil samples were collected from the IWP Ditch C (herein after referred to as Ditch C) as part of three different investigations. Three samples were collected from the 1988 DOE study, six samples were collected from the 1988 Chen Northern study, and 15 samples were collected from the 1994 ANL-W study.

The majority of the contamination (i.e., detected organic compounds and concentrations of metals and radionuclides greater than the upper limit of background) is present in the northern part of Ditch C. This may be because this area is closest to the MCTBD and water may back up into Ditch C. Of the samples that had contaminants greater than background for metals, location #1 had the highest detects above background with six contaminants (arsenic, chromium, copper, lead, mercury, and selenium). Typically, the sample locations on the southern end of Ditch C only exceeded the upper limit of background for only one or two contaminants. For radionuclides, no variations in horizontal contamination can be determined, because one true hit for U-238 was above background. The horizontal extent of the organic contamination cannot be determined because three samples were collected in the same general area. Therefore, the horizontal extent of contamination is the total dimensions of Ditch C (1.5 m wide and 152 m long [5 ft wide and 500 ft long]).

Little information is available on the vertical extent of contamination because most of Ditch C is fairly shallow and only 45 cm (2 ft) for most of the northern portion. However, a couple of samples on the southern end of Ditch C were collected at depths ranging to 2.4 m (8 ft). This one subsurface sample exceeded the upper limit of background only for mercury. This sample was detected at 0.13 mg/kg while the upper limit of background is 0.074 mg/kg. This one hit for contamination at this depth may be caused more by the low detection limit for mercury rather than actual contamination. Thus, the vertical extent of the contamination is the depth of the contaminant other than mercury. This would be the depth of silver, which was detected to a depth of 60 to 75 cm (2 to 2.5 ft). Most of this contamination was in the surface samples 0 to 15 cm (0 to 0.5 ft) (ANL-W 1997).

H1-10.1.6 ANL-01A (OU 9-04: Main Cooling Tower Blowdown Ditch)

This section summarizes the analytical results for soil samples collected at the MCTBD. This ditch was used to transport cooling tower water from the EBR II Reactor to the IWP. Regeneration waste from the demineralization columns was also discharged to this ditch. Therefore, all soil samples collected were analyzed for metals.

The majority of the concentrations that exceed background concentrations (when available) are located in the southern portion of the ditch near the cooling tower. However, there are some concentrations greater than the upper limit of background for some metals in the northwestern part of the ditch (e.g., antimony, cyanide, manganese, selenium, and silver). In addition, concentrations of all metals, except for one of the two analytical results for mercury (0.35 mg/kg) in old Ditch D, were below the UTL of background concentrations. The relatively short section of old Ditch D is eliminated as part of the extent of çontamination because once contaminant was detected and the arsenic and chromium (known COC contaminants) concentrations are below the background levels. Also, one mercury sample is much smaller in magnitude then the currently used portion of the ditch (13.4 vs. 0.35 mg/kg). Therefore, the horizontal extent of contamination is the dimensions of both the eastern and western part of the MCTBD (1 to 4.6 m wide and 213 m long [3 to 15 ft wide and 700 ft long]). Because the width of the ditch varies from 1 to 4.6 m (3 to 15 ft), an average width of 2 m (6 ft) will be used.

The majority of the contamination was detected in the top 15 cm (6 in.) of the ditch. Although there were some detections greater than the upper limit of background in some subsurface samples collected for manganese and silver, overall the majority of the contamination is confined in the top 15 cm (6 in.). Therefore, the vertical extent of contamination is assumed to be one-half the average depth to basalt 60 cm (2 ft) (ANL-W 1997).

H1-10.1.7 ANL-09 (OU 0-04: ANL Interceptor Canal)

This section summarizes the analytical results for soil samples collected at the Interceptor Canal. A line was used to discharge industrial wastes to the Interceptor Canal and was used to discharge radioactive liquid waste to the EBR-II Leach Pit. After each radioactive discharge to the Leach Pit, water was used to flush the pipe. However, this did not eliminate all contamination, and subsequently, the Interceptor Canal was contaminated. Radioactively contaminated soil was detected in the Interceptor Canal in 1969, and during subsequent radiation surveys in 1973 and 1975. Of the approximately 1,147 m^3 (1,500 yd^3) of contaminated soil, 76.45 m^3 (100 yd^3) were removed and the rest soil still remains at the site. Another radiation survey was conducted in 1993 that indicated elevated readings above background; therefore, in 1994, additional soil samples were collected from the Interceptor Canal.

The majority of the concentrations of which exceed background concentrations (when available) are located in the southern portion of the canal near the inlet pipe. However, for the radionuclides, concentrations exceeding background (when available) were located throughout the canal. Therefore, for radionuclides, the horizontal extent of contamination is defined as the entire length of the canal [434 × 9 m (1,425 × 30 ft)]. For metals, the horizontal extent of contamination is assumed to be bound by the samples collected.

At the Interceptor Canal, the number of detections of Cs-137 in the subsurface soil sample decreased from 99% in the surface soil samples to only 69% of the subsurface samples. Only one subsurface soil sample contained Cs-137 above the INEEL background value. Therefore, the vertical extent of contamination will be assumed to be the maximum depth of sample collected with a concentration greater than background 1 to 1.2 m (3 to 4 ft) (ANL-W 1997).

H1-10.1.8 ANL-35 (OU 9-04: Industrial Waste Lift Station Discharge Ditch)

This section summarizes the analytical results for soil samples collected at the Industrial Waste Lift Station Discharge Ditch. This ditch was used to receive industrial wastewater, primarily cooling water and photo processing wastes (e.g., photo developers, fixers, and stabilizers, and acids), but also including several retention tank overflows that may have contained ethanol, sodium hydroxide, and some radionuclides.

The majority of the concentrations of metals, radionuclides, and organic compounds that exceed background concentrations (when available) are located in the middle or eastern portion of the ditch. However, high concentrations of arsenic, copper, chromium, mercury, lead, silver, and zinc were detected in sample locations grid 18, ND03, 15, 18, and 19. Therefore, the horizontal extent of contamination is defined as the entire length of the ditch.

The vertical extent of contamination will be based on the depth of basalt across the entire length of the ditch. This depth varies from 0.06 to 0.8 m (0.2 to 2.5 ft) with an average depth of 0.3 m (1.0 ft) (ANL-W 1997).

H1-10.1.9 ANL-61A OU 9-01: PCB-Contaminated Soil Adjacent to ANL-61

This site is the east portion of site ANL-61, EBR II Transformer Yard, where PCB-contaminated soil was not removed. The only contaminants identified at this site are PCBs. Based on the nature and extent of contamination at ANL-61, the majority of the contamination is located at depth of 1.2 to 2.7 m (4 to 9 ft) and in one corner of the site with aerial dimensions of 4.6 × 6.4 m (15 × 21 ft). The aerial dimensions are bounded on three sides by the EBR-II facility and on the fourth side by the analytical results from the removal action that occurred at ANL-61.

Six soil samples were collected from this site with PCB concentrations ranging from 4.1 to 55 mg/kg at locations 534 (2.7 m [ft]) bgs and 537 (1.5 m [5 ft]) bgs, respectively. Two of these samples had PCB concentrations greater than the TSCA limit of 25 mg/kg. The two sample locations with the PCB concentrations greater than 25 mg/kg are in the northern part of the site near Building 768 at a depth of 1.5 m (5 ft) bgs (ANL-W 1997).

H1-11. WAG 10

H1-11.1.1 WAG 10 Description

WAG 10 includes areas in and around the INEEL that cannot otherwise be addressed on a WAG-specific basis. These include the regional Snake River Plain Aquifer and surface disposal sites and ponds identified at the INEEL but which are not included in other WAGs. The boundaries of WAG 10 are INEL boundaries or beyond, as necessary, to encompass real or potential impacts from INEL activities. WAG 10 consists of 12 specifically identified and seven generally identified sites divided into seven OUs. Specific sites at WAG 10 include, among others, the Liquid Corrosive Chemical Disposal Area located between WAGs 6 and 7, the Organic Moderated Reactor Experiment leach pond located between WAGs 4 and 5, former ordnance areas (including the old Naval Ordnance Disposal Area) located at numerous sites on the INEEL, and miscellaneous radionuclide-contaminated soil sites.

Potential release sites include disposal pits, a leach pond, ordnance areas, radionuclide-contaminated soil areas, sumps and pits, a gun range, and a buried telecommunications cable. WAG 10 is divided into 7 OUs with 42 potential release sites, including solid waste management or potentially hazardous sites. Possible contaminants include organic and inorganic chemicals (explosive compounds), radionuclides, and metals.

WAG 6 includes the EBR-I and the BORAX areas. These areas were both constructed to house test reactors and have since been decommissioned. EBR-I is now a national historic landmark. The BORAX area housed five reactors, but many of the facilities have been dismantled or moved, and no operations (other than monitoring) take place in the area.

Potential release sites include the BORAX-I burial site (grouped under WAG 5), a trash dump, fuel oil tanks, septic tanks and a leach pond. The WAG is divided into five OUs with 21 potential release sites. Potential contaminants from past operations are organic and inorganic chemicals, radionuclides, and metals.

WAG 6 and 10 ERA results are provided in Attachment H1-1 to this appendix.

H1-12. REFERENCES

DOE-ID, 1996a, *Comprehensive Remedial Investigation/Feasibility Study for TRA OU 2-13 at INEL,* U.S. Department of Energy Idaho Operations Office, DOE-ID-10531, Revision 0, December.

DOE-ID, 1996b, *Work Plan for Operable Unit 7-13/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study*, U.S. Department of Energy Idaho Operations Office, INEL-95/0343.

DOE-ID, 1997a, *Comprehensive Remedial Investigation/Feasibility Study for Test Area North Operable Unit 1-10 at the INEEL,* U.S. Department of Energy Idaho Operations Office, DOE-ID-10557, Revision 0, November.

DOE-ID, 1997b, *Comprehensive Remedial Investigation/Feasibility Study for the Idaho Chemical Processing Plan OU 3-13 at the INEEL-Part B, FS Report,* DOE-ID-10572, U.S. Department of Energy Idaho Operations Office.

DOE-ID, 1997c, *Revised Scope of Work for Operable Unit 7-13/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study*, U.S. Department of Energy Idaho Operations Office, INEL-95/0253.

ANL-W, 1997, COMPREHENSIVE RI/FS FOR ANL-W OU 9-04 AT INEEL (FINAL) VOLUME I (VOL.01), Argonne National Laboratory - West, W7500-0000-ES-01.

DOE-ID, 1998, *Addendum to the Work Plan for the Operable Unit 7-14/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study*, U.S. Department of Energy Idaho Operations Office, DOE-ID-10622.

DOE-ID, 1999, *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study,* U.S. Department of Energy Idaho Operations Office, DOE-ID-10607, January.

DOE-ID, 2000, *Comprehensive Remedial Investigation/Feasibility Study for the Central Facilities Area Operable Unit 4-13 at the Idaho National Engineering Laboratory,* U.S. Department of Energy Idaho Operations Office, DOE-ID-10680, Revision 1, July.